

formed round the electrode may serve as germ for formation of a layer of vapours, and this being once formed, the discharges occur by sparks.

GEOGRAPHICAL NOTES

WE are delighted to find that our good neighbours, the French, will not be behind the rest of the scientific world in exploring the depths of the sea. A large Government steamer, the *Travailleur*, will be at Bayonne on the 15th of next month to undertake a dredging expedition along the Atlantic coasts of Spain, under the charge of Prof. Milne-Edwards and the Marquis de Folin. Dr. Gwyn Jeffreys and the Rev. Mr. Norman have been officially invited to take part in this expedition. The Dutch are also making arrangements for a dredging expedition in the West Indies.

FROM a note in the June number of the *American Naturalist* it seems extremely likely that the U.S. Senate will endorse the approval given to the Howgate Polar Expedition by the House of Representatives. The steamer *Gulnare*, 230 tons burden, is being fitted up, and will have a crew of fifteen officers and men. The observing party, which will be left at the station as near Lady Franklin Bay as possible, will consist of twenty-five men, including the necessary scientific corps. A house of wood is being fitted up for the men to winter in on the shores of Discovery Bay, and a steam launch will form part of the expedition. "In making this report the committee respectfully state and demand that the object of the bill, as is shown by its terms, is to authorise a temporary station to be selected within the Arctic circle, for the purpose of making scientific discoveries, explorations, and observations, obtaining all possible facts and knowledge in relation to the magnetic currents of the earth, the influence of ice-floes therefrom upon the winds and seasons, and upon the currents of the ocean, as well as other matters incidental thereto, developing and discovering at the same time other and new whale-fisheries, now so material in many respects to this country. It is, again, the object of this bill that this expedition, having such scientific observations in view, shall be regularly made for a series of years under such restrictions of military discipline as will insure regularity and accuracy, and give the fullest possible return for the necessary expenditure; and again, in view of the fact that either the governments directly, or scientific corps under their authority, of Germany, Holland, Norway, Sweden, Austria, Denmark, and Russia, have concurrently agreed to establish similar stations, with like object, during the year 1880, it is believed that the interests and policy of our people concur in demanding that the United States should co-operate in the grand efforts to be thus made in the solution of the mysteries and secrets of the North Polar seas, upon which, in the opinion of scientists, depends so much that affects the health and wealth of the human race." This station will form one of the series of International Arctic Observatories to which we have already referred.

DURING the past year H.M.S. *Alert*, first under Sir G. S. Nares, and afterwards under Capt. Maclear, was engaged in very useful service on the west coast of South America, chiefly in examining the channels in about 50° S. lat. Trinidad Channel, which opens out a clear passage to the Pacific 160 miles north of Magellan Strait, has been carefully surveyed, together with its various ports and anchorages. This channel forms a valuable addition to our knowledge of these waters, as it will enable vessels bound westward to avoid the heavy sea often met with in the higher south latitude. Its southern shores are bounded by bold rugged mountains rising abruptly from the sea, and on the north side a low wooded country lies between the sea and the snow-clad mountains in the distance. The *Alert* also visited St. Felix and St. Ambrose Islands, which, owing to the depth of the soundings obtained, are thought to be unconnected with both the South American continent and the San Juan Fernandez group. Capt. Maclear describes St. Ambrose Island as volcanic, composed of lava in horizontal strata, intersected vertically by masses of basalt. Vegetation is scant, and the island is without water; though frequented by sea-birds, its sides are too steep and rugged for guano to collect. From the soundings it would seem that this, as well as the other islands, rises as an isolated mountain from a submarine plateau.

At the meeting of the Paris Geographical Society of May 7 a Greek physician, Dr. Panagiotēs Potagos, was introduced by MM. Ujfalvy and Duveyrier as one of the most extensive tra-

vellers of our time. M. Potagos, we are told, has since 1867, beginning at Tripoli in Asia Minor, visited Teheran, skirted the Paropamisus on his way to Medjid, Herat, Kandahar and Kabul; crossed the Hindu Kush by one of the most difficult passes, traversed Badakshan, Wakhan, and all Kashgaria, arriving at Hami in 1871. Thence he went to Ulussutai in the heart of Mongolia, returning to Hami, where all his notes and collections were destroyed, and he himself kept prisoner for more than a year. Thence continuing his journey, he reached Kulja, and returned to Europe by Semipalatinsk, Omsk, Moscow, and St. Petersburg. After staying at Salonica for two years, he went to Bombay and Peshawur, descended the Indus to Karachi, thence to Bunder-Abbas in Persia, crossed the mountains of Laristan, and made his way to Kabul, reaching India again by the Kurram Valley, meeting Major Cavagnari on his way. From Bombay he went to East Africa, and penetrated into the interior farther than Schweinfurth. The principal sphere of his African journeys seems to have been in the region of the River Beré, which M. Deveyrier is of opinion is the Wellé of Schweinfurth, but which, according to M. Potagos, cannot be connected with the Aruwimi of Stanley, but rather with the basin of the Shari. The observations of M. Potagos are, however, too vague to be of much scientific value, unless, indeed, further details be forthcoming.

MR. LAURENCE OLIPHANT has lately returned to England from a journey of exploration on the eastern side of the River Jordan, and is, we believe, engaged in preparing for publication an account of the results of his investigations.

THE map of Equatorial Africa, on the scale of 15·8 miles to one inch, on which Mr. E. G. Ravenstein has for some time been engaged for the Geographical Society, is stated to be approaching completion, and it is expected that the lithographed sheets will be ready during the summer. An analytical catalogue of works on African travel and geography, including papers in periodicals, is being compiled at the same time.

MR. STANFORD has just published a fine new wall map of New Zealand, on the scale of seventeen miles to an inch. The whole of the coast line, together with the details of harbours and banks of these islands, has been carefully reduced from the most recent Admiralty Charts. The interior details of rivers and mountains, roads and railways, towns and villages, have been plotted in from the various Government surveys and partly from private sources. Although not over-crowded with names, it contains, besides the chief physical features, the names of all villages and other centres of population, together with the names of many places of interest, such as the geysers or hot springs and the boiling lakes of the North Island. The principal Maori tribal names are also given over the areas once occupied by them. The map is coloured to show the boundaries of the new administrative divisions, all of which are named. The large size, accuracy, and clearness of this map render it eminently useful for teaching purposes.

THE annual address of Chief Justice Daly, President of the American Geographical Society, on the Geographical Work of the World in 1878 and 1879, is as usual, remarkably comprehensive and well arranged; indeed it is the best summary of the subject we have seen.

L'Exploration of June 2 contains an interesting article on the various explorations of M. Paul Soleillet in Africa. There is also a map of the French possessions and factories on the coast of Guinea.

"ANGLO-CANADIAN" sends us the draught of a scheme for reaching the North Pole by balloon in comparatively few days, at a cost which must take the gas completely out of the elaborate and expensive scheme of Commander Cheyne. Our correspondent has patented a directable balloon, which he maintains is capable of being moved at a rapid rate in any direction. We need not enter into the details of his plan, which reads very glibly, but which we should like to see subjected to rigid scientific tests. The whole scheme is to cost only 2,000*l.*, including a steamer to be chartered to Spitzbergen to take the necessary compressed gas which "Anglo-Canadian" would use as fuel. We do not attach much importance to the attainment of the Pole, and should prefer to see any money that can be raised for Arctic exploration in this country devoted to the founding of one of those international series of Arctic observations from which England is conspicuously absent.

It may interest such of our readers as are conversant with the German language to know that in the course of the present month Dr. Ernst von Hesse Wartegg will deliver a lecture at the German Athenæum (93, Mortimer Street, W.), entitled "Das Leben der Beduinen." The secretary of the institution will furnish all particulars regarding exact date and admission to the lecture on application by letter.

AFTER the example of the German and Austrian Alpine Clubs, a Bohemian Mountain Club is now in course of formation.

THE authors of Sweden and Finland have edited a festive paper, "Nordostpassagen," in honour of Prof. Nordenskjöld's return, which deserves high commendation, both with regard to text and illustrations. It is published by C. E. Fritze, of Stockholm.

IN a letter from M. Berlioux, read at the Paris Academy of Sciences on May 31, the writer attempts to prove from the last expedition of Dr. Rohlfs in the Eastern Sahara the marvellous correctness of Ptolemy's Tables.

It is stated that Col. Gordon, who has resigned his post on the staff of Lord Ripon, is to proceed to Zanzibar to join the Belgian African exploring expedition.

THE question of the speedy completion of the Ordnance Survey came up in the House of Commons last Friday, when there was an almost unanimous consensus of opinion that Government ought at once to advance as much money as was necessary to complete the work. The reply of Mr. Adam and Mr. Gladstone was virtually a *non possumus*. It was not so much the difficulty of advancing the money as of obtaining the necessary amount of skilled labour to carry on the work under pressure. At the present rate the survey cannot be completed for eighteen years.

DR. SIEMENS' NEWEST ELECTRICAL RESULTS

A PAPER was read on Thursday last before the Society of Telegraph Engineers by Dr. Siemens, F.R.S., upon "Recent Applications of the Dynamo-Electric Current to Metallurgy, Horticulture, and the Transmission of Power." The author first referred to the inaugural address which he had given before the Society on his election to his second presidency, wherein he drew attention to the applicability of the dynamo-electric current to purposes beyond the range of what electricity had theretofore been employed in effecting. On the present occasion he corroborated his statements by a reference to recent experimental results of his own.

The first part of the paper had reference to an electric furnace. This furnace consists of any ordinary crucible of plumbago or other highly refractory material, which is placed in a metallic jacket or outer casing, the intervening space being filled up with pounded charcoal or other bad conductor of heat. A hole is pierced through the bottom of the crucible for the admission of a rod of iron, platinum, or dense carbon, such as is used in electric illumination. The cover of the crucible is also pierced for the reception of the negative electrode, by preference a cylinder of compressed carbon of comparatively large dimensions. At the end of a beam supported at its centre is suspended the negative electrode by means of a strip of copper, or other good conductor of electricity, the other end of the beam being attached to a hollow cylinder of iron free to move vertically within a solenoid coil of wire, presenting a total resistance of about fifty units or ohms. By means of a sliding weight the preponderance of weight of the beam in the direction of the solenoid can be varied so as to balance the magnetic force with which the hollow iron cylinder is drawn into the coil. One end of the solenoid coil is connected with the positive, and the other with the negative pole of the electric arc, and, being a coil of high resistance, its attractive force on the iron cylinder is proportional to the electromotive force between the two electrodes, or, in other words, to the electrical resistance of the arc itself.

An automatic adjustment of the arc thus arises of great importance to the attainment of advantageous results in the process of electric fusion; without it the resistance of the arc would rapidly diminish with increase of temperature of the heated atmosphere within the crucible, and heat would be developed in the dynamo-electric machine to the prejudice of the electric furnace. The sudden sinking or change in electrical resistance of the material undergoing fusion would, on the other hand,

cause sudden increase in the resistance of the arc, with a likelihood of its extinction, if such self-adjusting action did not take place.

Another important element of success in electric fusion consists in constituting the material to be fused the positive pole of the electric arc. It is well known that it is at the positive pole that the heat is principally developed, and fusion of the material constituting the positive pole takes place even before the crucible itself is heated up to the same degree. This principle of action is of course applicable only to the melting of metals and other electrical conductors, such as metallic oxides, which constitute the materials generally operated upon in metallurgical processes. In operating upon non-conductive earth or upon gases it becomes necessary to provide a non destructible positive pole, such as platinum or iridium, which may, however, undergo fusion and form a little pool at the bottom of the crucible.

In this electrical furnace some time, of course, is occupied to bring the temperature of the crucible itself up to a considerable degree, but it is surprising how rapidly an accumulation of heat takes place. In working with the modified medium-sized dynamo machine, capable of producing thirty-six webbers of current with an expenditure of four horse-power, and which, if used for illuminating purposes, produces a light equal to 6,000 candles, I find that a crucible of about twenty centimetres in depth, immersed in a non-conductive material, is raised up to a white heat in less than $\frac{1}{4}$ an hour, and the fusion of one kilogram of steel is effected within, say, another $\frac{1}{4}$ -hour, successive fusions being effected in somewhat diminishing intervals of time. It is quite feasible to carry on this process upon a still larger scale by increasing the power of the dynamo-electric machine and the size of the crucibles.

It was shown by means of a calculation that this furnace utilises $\frac{1}{3}$ of the horse-power actually expended, and as the efficiency of a good steam-engine is $\frac{1}{3}$, that of the electric furnace is $\frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$. Now as it takes theoretically 450 heat units to melt 1 lb. of steel, there will be required actually $450 \times 15 = 6,750$ units in working with the electric furnace, or about the heat-energy residing in a pound of ordinary coal. To melt a ton of steel in crucibles in the ordinary air-furnace as practised at Sheffield, $2\frac{1}{2}$ to 3 tons of best Durham coke are consumed. A ton of coal is consumed per ton of steel produced if the regenerative gas furnace is used for heating the crucibles, whilst to produce steel in large quantities on the open hearth of this furnace about 12 cwt. of coal per ton of steel suffice. The electric furnace may therefore be considered as economically superior to the ordinary air-furnace, and, barring some incidental losses not included in the calculation, is nearly equal to the regenerative gas-furnace as far as economy of fuel is concerned. In favour of the electric furnace is an almost unlimited temperature, easy application, a neutral atmosphere within the crucible, and the circumstance that the heat within the crucible is greater than that external to it, whereas in ordinary fusion the temperature of the crucible is higher than that of metal within.

On the occasion of reading the paper a pound of broken files was melted in a cold crucible by means of a current of 72 webbers in fifteen minutes, and cast in a liquid state, a second casting being effected in eight minutes. These and other brilliant successes of the new apparatus were hailed with ringing cheers.

In the second portion of the paper, referring to electro-horticulture, the author explained the experiments by means of which he has come to the conclusion that electric light produces the colouring matter chlorophyll in the leaves of plants, that it aids their growth, counteracts the effects of night frosts, and promotes the setting and ripening of fruit in the open air. It appears, further, that, at all events for certain short periods, plants do not require a period of rest during the twenty-four hours, but make increased and vigorous progress if subjected during daytime to sunlight and to electric light at night. These observations on combined sun and electric light agree with those made by Dr. Schübler of Christiania, who found as the result of continued experiment in the north of Europe, during an Arctic summer, that plants, when thus continuously growing, develop more brilliant flowers and larger and more aromatic fruit than when under the alternating influence of light and darkness. As Dr. Siemens has found that under the influence of electric light plants can sustain increased stove heat without collapsing, he is of opinion that forcing may be effected in an electric stove or enclosure containing an electric light, and that horticulturists may thus grow fruit of excellent aroma and flowers of great brilliancy without immediate solar aid. To test what